A.D. 1869, 20*th* JANUARY. N° 186.

Manufacturing Gas and Melting Iron Ore.

LETTERS PATENT to Henri Adrien Bonneville, of the British and Foreign Patent Offices, 10, Sackville Street, Piccadilly, in the County of Middlesex, and 18, Chaussée d'Antin, Paris, in the Empire of France, Patent Agent, for the Invention of "IMPROVEMENTS IN THE MANUFACTURE OF ILLUMINATING GAS AND OF SPONGE BY THE ACTION OF HYDROCARBON LIQUIDS OR FLUIDS ON METALLIC ORES, AND IN THE FURNACES FOR MELTING SAID SPONGE AND OTHER METALS."—A communication from Cyrille Jean Caumon (also known as John Absterdam), of the City of Toulouse, France, Scientific and Mechanical Engineer, at present residing at New York, in the County and State of New York, United States of America.

Sealed the 6th July 1869, and dated the 20th January 1869.

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PROVISIONAL SPECIFICATION left by the said Henri Adrien Bonneville at the Office of the Commissioners of Patents, with his Petition, on the 20th January 1869.

I, HENRI ADRIEN BONNEVILLE, of the British and Foreign Patent Offices, 10, Sackville Street, Piccadilly, in the County of Middlesex, and

18, Chaussée d'Antin, Paris, in the Empire of France, Patent Agent, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN THE MANUFACTURE OF ILLUMINATING GAS AND OF SPONGE BY THE ACTION OF HYDROCARBON LIQUIDS OR FLUIDS ON METALLIC ORES, AND IN THE FURNACES FOR MELTING SAID SPONGE AND OTHER METALS," a communication from Cyrille Jean Caumon (also known as John Absterdam), of the City of Toulouse, France, Scientific and Mechanical Engineer, at present a person resident at New York, in the County and State of New York, United States of America, to be as follows:—

The Invention communicated to me consists in manufacturing illuminating gas by passing hydrocarbon fluids through heated metallic ores; also in converting iron ore into sponge, balls, or blooms by decomposing hydrocarbon vapours into carburetted hydrogen or illuminating gas; also in a furnace composed of two cupolas one inside the other and supported by a bed plate constructed of two concentric rings and provided with trapdoors for the purpose of melting sponge or metals free from contact with the atmospheric air and for conveniently discharging the ashes and dross after the process of melting has been accomplished. The inner cupola is strengthened by radiating partitions constructed of fire-bricks with segmental draught passages.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said Henri Adrien Bonneville in the Great Seal Patent Office on the 7th July 1869.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, HENRI ADRIEN BONNEVILLE, of the British and Foreign Patent Offices, 10, Sackville Street, Piccadilly, in the County of Middlesex, and 18, Chaussée d'Antin, Paris, in the Empire of France, Patent Agent, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Twentieth day of January, in the year of our Lord One thousand eight hundred and sixty-nine, in the thirty-second year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Henri Adrien Bonneville, Her special licence that I, the said Henri Adrien Bonneville, my executors, administrators, and assigns, or such others as I, the said Henri

Adrien Bonneville, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN THE MANUFACTURE OF ILLUMINATING GAS AND OF SPONGE BY THE ACTION OF HYDROCARBON LIQUIDS OR FLUIDS ON METALLIC ORES, AND IN THE FURNACES FOR MELTING SAID SPONGE AND OTHER METALS," a communication from Cyrille Jean Caumon (also known as John Absterdam), of the City of Toulouse, France, Scientific and Mechanical Engineer, at present a person resident at New York, in the County and State of New York, United States of America, upon the condition (amongst others) that I, the said Henri Adrien Bonneville, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said Henri Adrien Bonneville, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This Invention, communicated to me, relates to a process for manufacturing illuminating gas in which hydrocarbon fluids, such as rosin, rosin oil, crude petroleum, waste vapours from oil wells, etc., are passed through a retort filled with metallic ore heated to a red heat in such a manner that a portion of the surplus carbon contained in said hydrocarbon fluids will combine with the metal of the ore, while another portion thereof combines with the oxygen of the ore and passes off in the form of carbonic acid, the remainder of the hydrocarbon being converted into carburetted hydrogen or illuminating gas, and thereby a double object is accomplished, viz., the production of a permanent illuminating gas, and also the conversion of the ore into sponge of a superior quality at a comparatively small cost.

The Invention further relates to a furnace for melting the sponge produced by the above-named process, and also for melting broken pieces or scraps of wrought iron and other metals, said furnace being

constructed of a double cupola one within the other, the inner cupola being provided with a hinged bottom which opens downward in such a manner that when the inner cupola is filled with the sponge or metal to be melted and the feed is introduced in the annular space surrounding said cupola the process of melting the sponge or metal can be effected without permitting it to come in contact with the atmospheric air, and if the melting has been accomplished and the fluid metal has been drawn off the remaining contents of the inner cupola and of the annular space surrounding the same can be readily discharged by opening the hinged doors.

The Invention relates, finally, to the arrangement of partitions built up between the inner and outer cupolas of bricks with segmental apertures in such a manner that said partitions serve to strengthen the inner cupola without materially interrupting the circulation of the flames through the annular space surrounding the inner cupola.

This Invention is illustrated in the accompanying Drawing, in which Fig. 1 represents a longitudinal vertical section of the retort and its apendages; Fig. 2 is a vertical central section of the double cupola furnace; Fig. 3 is a horizontal section thereof. Similar letters indicate corresponding parts.

A represents a retort which is supported by the brick wall B that forms a fire-place and flue, so that said retort together with its contents can be readily heated to any desired degree. This retort is intended to be charged with metallic ore, particularly iron ore, and it is provided with a pipe C through which hydrocarbon fluids, such as rosin oil, crude petroleum, waste vapors from oil wells, waste oils or vapors from oil distilleries, or tar, can be injected, and made to permeate the ore in the retort. When the hydrocarbon is to be injected in a liquid form the pipe C must form a syphon, as shown, to prevent the escape of gas evolved in the retort, but if the hydrocarbon fluid is to be introduced in the form of vapor the syphon is dispensed with and hydrocarbon is introduced through the pipe *a* and pipe *c* in the retort. The gas escapes through the exit pipe D which is inserted into the retort at the end opposite to the supply pipe C. The pipe *a* is connected with a retort or still containing the hydrocarbon liquid in a state of ebulition or distillation, so that when the hydrocarbon fluid comes in contact with the red-hot metallic ore in the retort it is decomposed by the ore and the oxygen of the ore is taking off a portion of its carbon, and it is converted

into carburetted hydrogen gas and carbonic acid gas, which latter is retained in the purifyers while the former is conveyed into a gasometer and used for illuminating and heating purposes. I am aware that illuminating gas has been manufactured by introducing hydrocarbon liquids, such as rosin, rosin oil, tar, petroleum, or fats, into a retort filled with red-hot coke, coal, pumice stone, brickbats, or other refractory and absorbent materials which are capable of abstracting from the hydrocarbon liquids a portion of their carbon, thereby decomposing the same into gas. This process however has the disadvantage that the coke or other material after a short time becomes surcharged with carbon and thereby is rendered inoperative, and after the same has been removed from the retort it has no commercial value. By using metallic ores for decomposing hydrocarbon fluids and converting them into illuminating gas I gain the following advantages:—First, I deoxydize the ore which is then ready for the furnace or the forge, as the case may be; second, when iron ore is used a sponge of great value is formed, which when taken out of the retort in a red-hot state can be introduced immediately into a furnace balled and bloomed ready to be forged into bars or plates of wrought iron or steel, as the case may require; third, the blooms so obtained will pay the expenses of making the illuminating gas.

In carrying out my Invention I use the same kind of retorts as are now used for coal gas, and I put them up in the same manner as now done in ordinary gas works, with the exception that I add to the works an ordinary petroleum still or retort for boiling and vaporizing the hydrocarbon liquid, the vapor of which I convey to the gas retorts, passing them through the mass of red-hot ore contained in said retorts by means of ordinary metallic pipes or tubes and branching off from the main vapor pipe into each retort, each retort being supplied with an exit pipe at the end opposite to that where the supply pipe enters. The supply of hydrocarbon is regulated by a stop-cock. I charge the retort with the ore in the same manner that it is now done with coal after having previously broken the ore in suitable fragments. If the ore is intended to be broken very fine I mix with it some solid carbonacious substance, such as coal, coke, charcoal, wood, peat, or sawdust, so as to allow the hydrocarbon vapors to pass freely through the charge and up through the exit pipe, and I replace the charge of ore in the retorts as soon as the previous charge has been sufficiently deoxydized, which

fact is to be ascertained by a little practice according to the kind of ore employed for converting the hydrocarbon vapor into gas.

For the purpose of melting the deoxydized ore after the same has been discharged from the retort I use a double cupola furnace, such as shown in Figs. 2 and 3 of the Drawing. This furnace consists of an outer cupola F which is built up of brick upon a metallic frame or bed plate G. This bed plate consists of two concentric rings *e*, *f*, which are connected by radial arms *g*, and the inner ring serves to support the inner cupola H, as clearly shown in Fig. 2 of the Drawing. This inner cupola is intended to receive the charge to be melted; it is built up of fire-brick and strengthened by radial partitions *h* which extend from the outer surface of the inner cupola to the inner surface of the outer cupola. The bricks from which these partitions are made are provided with segmental apertures *i* so that the circulation in the annular space I between the two cupolas is interrupted as little as possible. This annular space is filled with the fuel, and the air for the combustion is supplied by means of tuyeres *j*. The spaces between the arms *g* of the bed plate and the space in the interior of the inner ring *f* are closed by hinged doors *k*, *l*, which can be closed and sustained in that position by props *m*, as shown in Fig. 1. Previous to introducing the fuel and the charge of metal or ore I place on these doors *k*, *l*, layers of sand or clay, then the inner cupola is filled with the metal or ore to be melted, and when this inner cupola has been charged and closed I fill the annular space I with coal and apply the blast. The metal in the inner cupola is thus melted without being exposed to the contact of the atmospheric air. The molten metal is drawn off through the tap hole *n* in the inner cupola, which corresponds with a similar tap hole *o* in the outer cupola, and after the process of melting has been completed and all the molten metal has been drawn off I open the doors *k*, *l*, and dump the ashes from the annular space I and the dross remaining in the inner cupola. By these means I am enabled to melt the sponge or deoxydized ore obtained from the process heretofore described of treating ores with hydrocarbon fluids, and I can also melt large masses of brass or copper and zinc and other metals without loss.

Having thus described the nature of the said improvements, and the manner of carrying them into effect, I would have it understood that I do not confine myself to the precise details above enumerated, as these

may obviously be modified without departing from the principle of the Invention; but what I claim is,—

Manufacturing illuminating gas or carburetted hydrogen gas by passing hydrocarbon fluids through heated metallic ores, as set forth.

Secondly. The conversion of iron ore into sponge, balls, or blooms by decomposing hydrocarbon vapors into carburetted hydrogen gas, substantially in the manner described.

Thirdly. A furnace composed of two cupolas supported by a bed plate constructed of concentric rings and provided with hinged trapdoors, substantially in the manner shown and described.

Fourthly. The radiating partitions between the inner and outer cupolas, said partitions being constructed with draught openings, substantially as and for the purpose set forth.

In witness whereof, I, the said Henri Adrien Bonneville, have hereto set my hand and seal, this Twenty-fifth day of June, in the year of our Lord One thousand eight hundred and sixty-nine.

H. BONNEVILLE. (L.S.)

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1869.

A.D. 1869. JAN. 20. Nº 186.
BONNEVILLE'S SPECIFICATION.

(1 SHEET)

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FIG. 2.

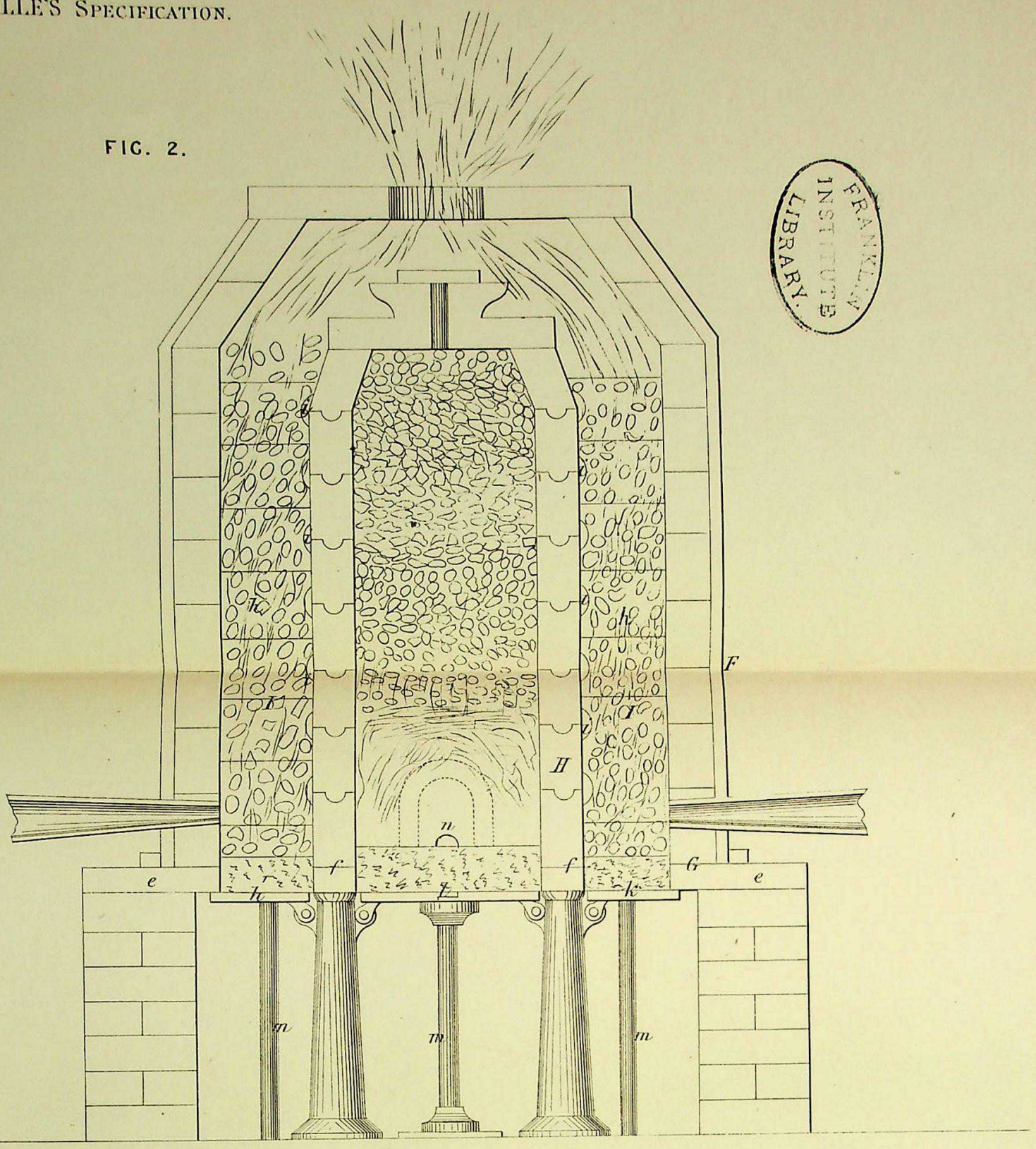


FIG. 3.

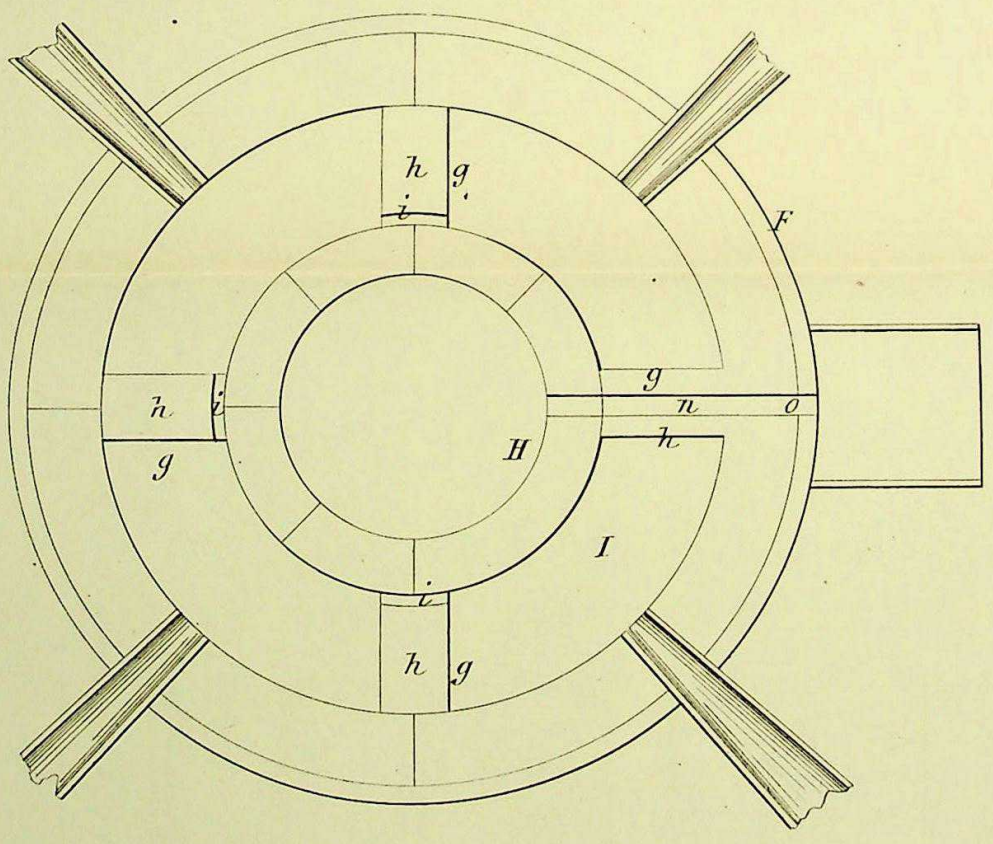
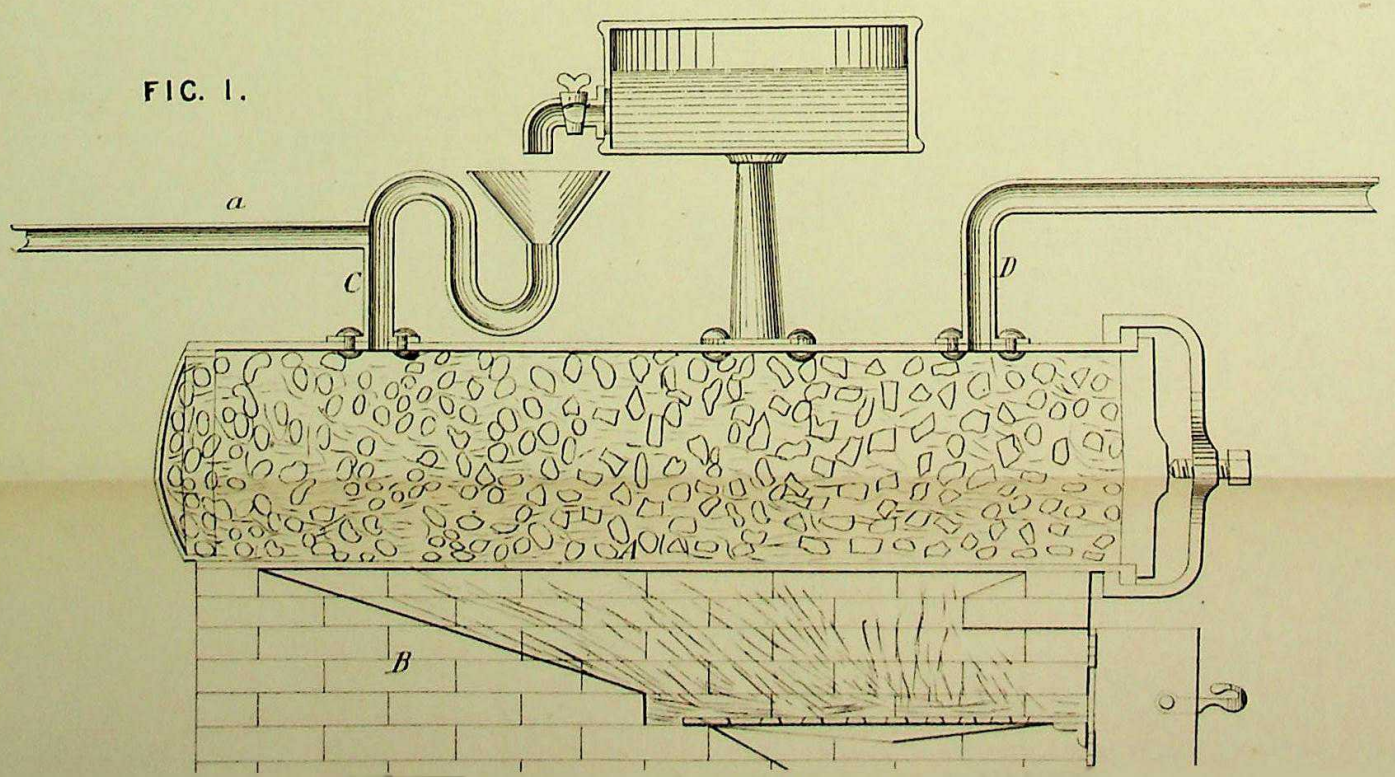


FIG. 1.



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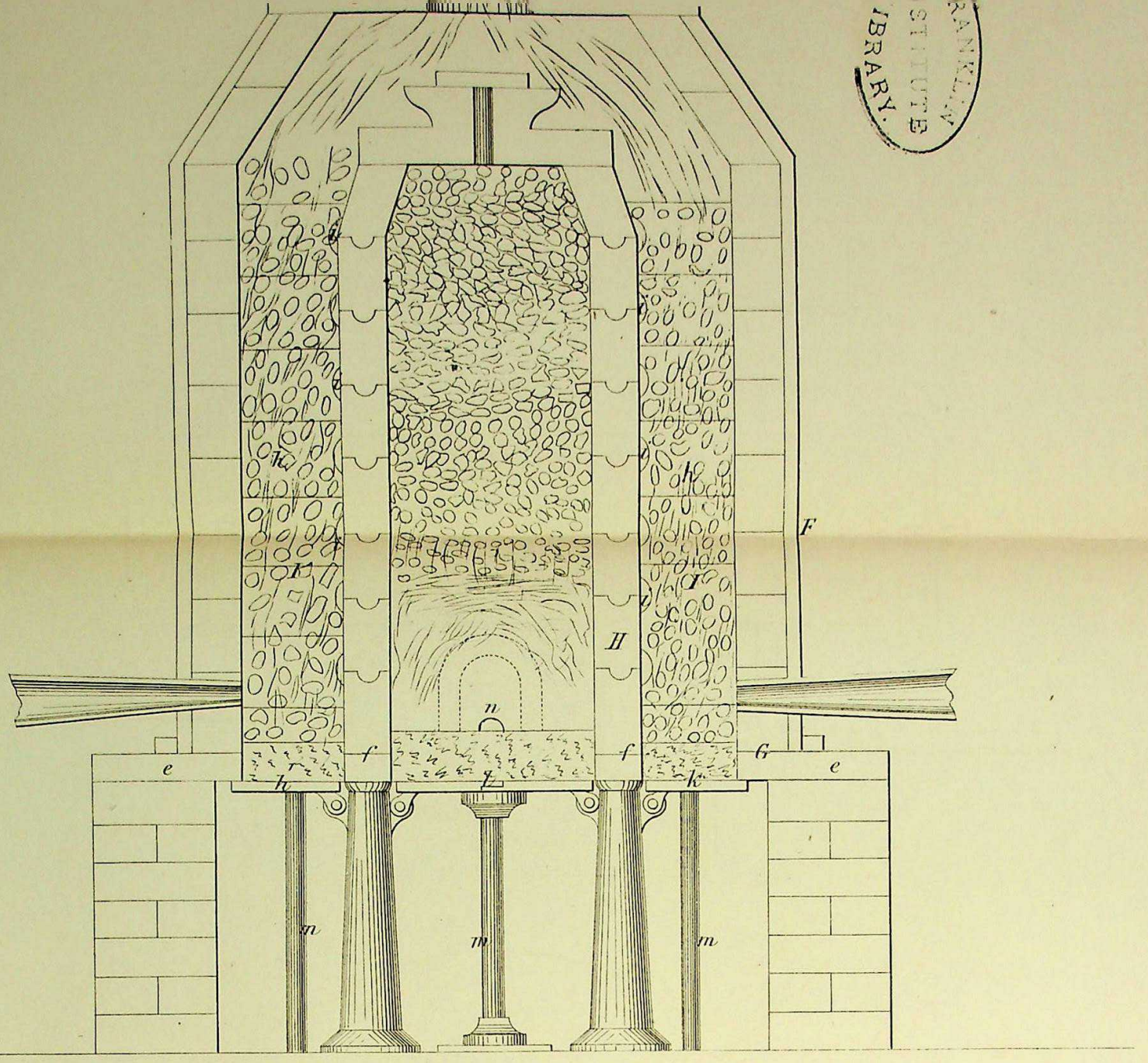


FIG. 3.

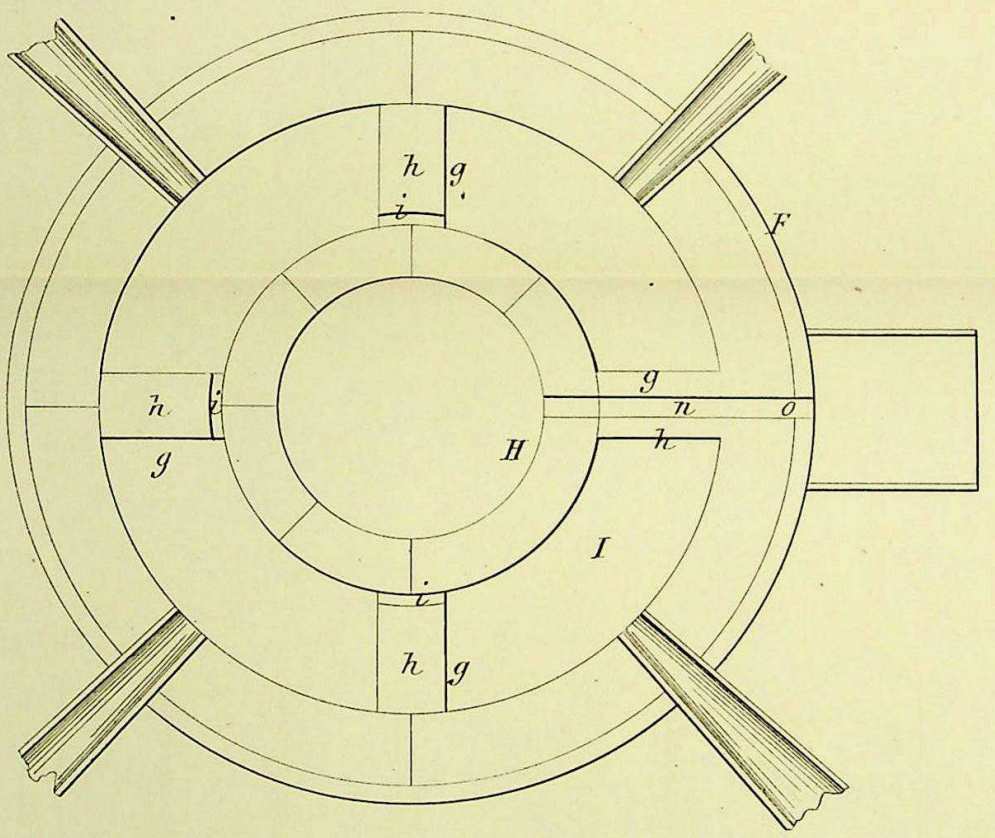
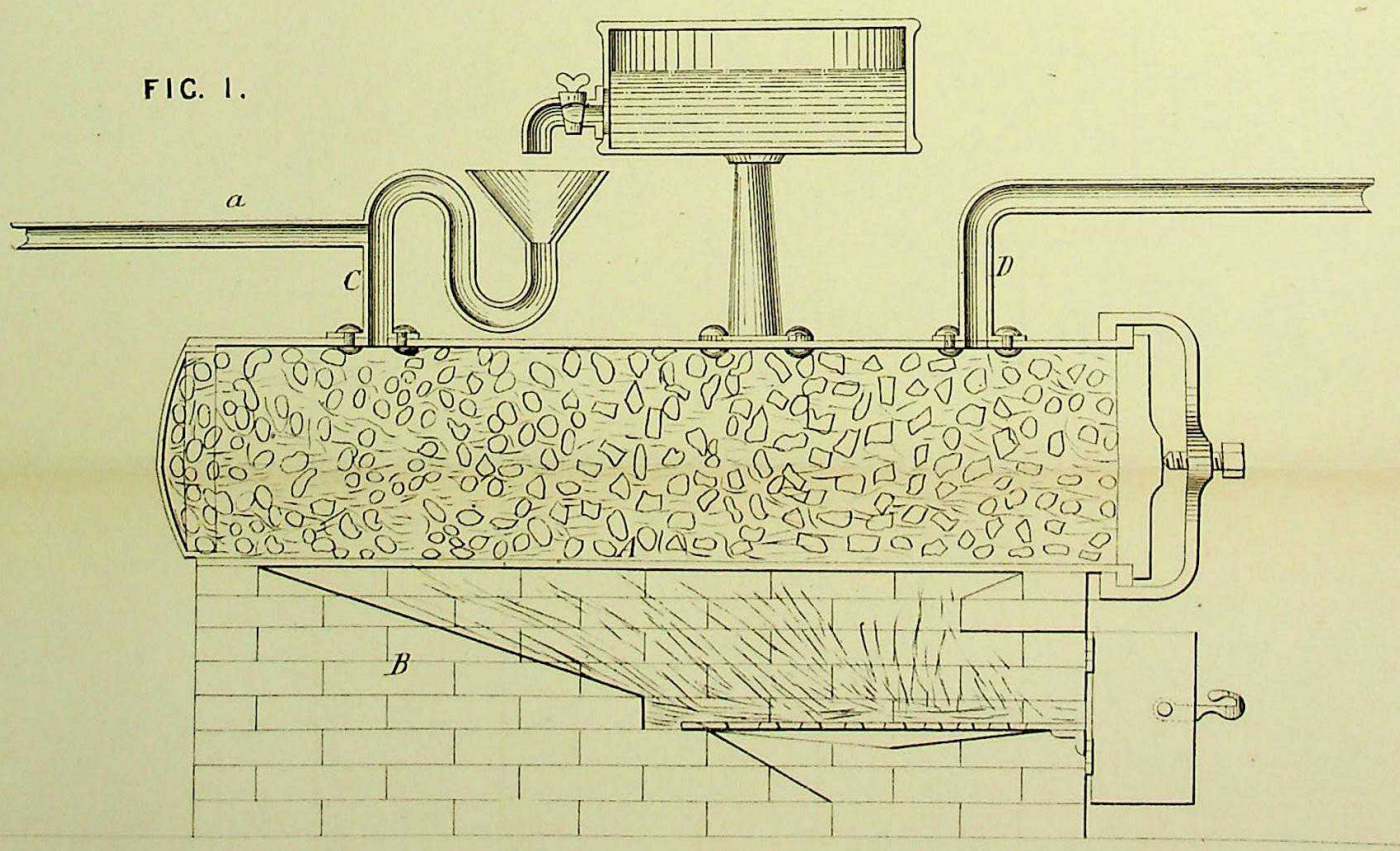


FIG. 1.



The filed drawing is partly colored.

Drawn on Stone by Malby & Sons

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